Inventor(s): Navarrini et al.

Attorney Docket No.: 108910-00127

I. AMENDMENTS TO THE CLAIMS

1. (Currently Amended) Process for obtaining hydrofluoroethers of formula (I):

$$A-(R_f)_{n0}-CF(R_{f1})-O-R_h$$
 (I)

wherein:

n0 is zero or 1;

R_f is a bivalent radical:

C₁-C₂₀, preferably C₂-C₁₂₇ linear or branched (per)fluoroalkylene, optionally containing one or more oxygen atoms;

-CFW'O-(R_{f2})-CFW-, wherein W and W', equal or different, are F, CF₃; R_{f2} is a (per)fluoropolyoxyalkylene containing one or more of the following units, statistically distributed along the chain, (C_3F_6O); (CFWO) wherein W is as above; (C_2F_4O), (CF₂(CF₂)_zCF₂) wherein z is an integer equal to 1 or 2; (CH₂CF₂CF₂);

 R_{f1} is F or a C_1 - C_{10} linear or branched (per)fluoroalkyl or (per)fluorooxyalkyl radical; R_h is a C_1 - C_{20} , preferably C_1 - C_{10} linear, branched when possible, saturated or unsaturated when possible alkyl, or C_7 - C_{20} alkylaryl, optionally containing heteroatoms selected from F, O, N, S, P, Cl; and/or functional groups preferably selected from $-SO_2F$, $-CH = CH_2$, $-CH_2CH = CH_2$ and NO_2 ;

A = F, $(R_{h2}O)-CF(R_{f4})-$, -C(O)F, wherein

- R_{h2} , equal to or different from R_h , has the R_h meanings;
- R_{f4}, equal to or different from R_{f1}, has the R_{f1} meanings;

wherein a mono- or bifunctional carbonyl compound of formula:

$$B-R_f-C(O)R_{f1}$$
 (IV)

wherein B is F or $-C(O)R_{f4}$, R_{f} , R_{f1} and R_{f4} being as above,

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is reacted with at least one equivalent of a fluoroformate of formula:

$$R-OC(O)F$$
 (III)

wherein [[R - R_h or R_{h2}]] $R = R_h$ or R_{h2} as above;

in the presence of an ion fluoride compound (catalyst) and of a dipolar aprotic organic compound, liquid and inert under the reaction conditions.

- 2. (Original) A process according to claim 1, wherein the (C_3F_6O) unit of R_{f2} can be $(CF_2CF(CF_3)O)$ or $(CF(CF_3)CF_2O)$.
- 3. (Previously Presented) A process according to claim 1, wherein in formula (I) R_{f1} and R_{f4} of A, independently the one from the other, are F, CF_3 .
- 4. (Currently Amended) A process according to claim 1, wherein when R_f of formula
 (I) is a (per)fluoroalkylene, R_f is selected from the following groups:
 -CF₂-, -CF₂CF₂-, -CF₂CF₂-, -CF₂(CF₃)CF-; when R_f contains one oxygen atom it
 preferably is -CF₂(OCF₃)CF-.
- 5. (Currently Amended) A process according to claim 1, wherein R_{f2} is a perfluoropolyoxyalkylene chain having number average molecular weight from 66 to 12,000 , preferably from 100 to 5,000, more preferably from 300 to 2,000.
- 6. (Currently Amended) A process according to claim 5, wherein when R_{f2} is a perfluorooxyalkylene chain it is preferably selected from the following structures:

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a) $-(CF_2CF_2O)_m(CF_2O)_n(CF_2CF(CF_3)O)_p(CF(CF_3)O)_{q-1}$

b) $-(CF_2O)_n(CF_2CF(CF_3)O)_p(CF(CF_3)O)_{q-}$;

c) $-(CF_2CF_2O)_m(CF_2O)_n$;

wherein:

m is comprised between 0 and 100 extremes included;

n is comprised between 0 and 50 extremes included;

p is comprised between 0 and 100 extremes included;

q is comprised between 0 and 60 extremes included; and

m+n+p+q>0 and the number average molecular weight of R_{f2} being in the above limited.

7. (Original) A process according to claim 6, wherein R_{f2} is a perfluorooxyalkylene c), and the m/n ratio ranges from 0.1 to 10, n being different from zero and the number average molecular weight comprised within the above limits.

8. (Previously Presented) A process according to claim 1, wherein in formula (I) R_h and R_{h2} having the following meanings:

-CH₃, -CH₂CH₃,

-CH₂CH₂CH₃, -CH(CH₃)₂, -CH₂CH=CH₂.

9. (Previously Presented) A process according to claim 1, wherein the ion fluoride compound is any compound capable to generate ion fluorides when, in the presence of dipolar aprotic solvents, at temperatures from 20 °C up to 200 °C, said dipolar aprotic

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solvents being acetonitrile, dimethyl-formamide, glyme, ethylene polyoxides

dimethylethers (PEO-dimethylethers).

10. (Currently Amended) A process according to claim 9, wherein the ion fluoride

compound is selected from the group comprising consisting of metal fluorides -

preferably alkaline or alkaline earth metal-fluorides; AgF; alkylammoniumfluorides,

alkylphosphonium-fluorides, wherein the nitrogen and respectively the phosphor atom

can be substituted with one or more C₁-C₈ alkyl groups, equal to or different from each

other.

11. (Previously Presented) A process according to claim 9, wherein the ion fluoride

compound is CsF and KF.

12. (Previously Presented) A process according to claim 9, wherein the catalyst is

optionally supported.

13. (Previously Presented) A process according to claim 1, wherein the catalyst

amounts, expressed in % moles, are in the range 0.1% - 50% with respect to the mono-

or bifunctional carbonyl compound of formula (IV).

14. (New) A process according to claim 1, wherein the dipolar aprotic organic

compound is selected from the group consisting of acetonitrile, dimethylformamide,

glyme, ethylene polyoxides dimethylethers (PEO-dimethylethers.

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15. (New) A process according to claim 1, wherein the ratio by weight between the

dipolar aprotic organic compound and the ion fluoride compound ranges from 1:100 to

100:1.

16. (New) A process according to claim 1, wherein tertiary amines and/or phase

transfer catalysts are used.

17. (New) A process according to claim 1, wherein the reaction temperature in the

process is from 60 °C to 200 °C.

18. (New) A process according to claim 1, carried out in a discontinuous way.

19. (New) A process according to claim 1, carried out in a continuous way.

20. (New) A process according to claim 1, wherein R_f is a bivalent radical: C₂-C₁₂,

linear or branched (per)fluoroalkylene, optionally containing one or more oxygen atoms.

21. (New) A process according to claim 1, wherein R_h is a C₁-C₁₀ linear, branched

when possible, saturated or unsaturated when possible alkyl, optionally containing

heteroatoms selected from F, O, N, S, P, Cl; and/or functional groups preferably

selected from $-SO_2F$, $-CH = CH_2$, $-CH_2CH = CH_2$ and NO_2 .

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22. (New) A process according to claim 5, wherein R_{f2} is a perfluoropolyoxyalkylene chain having number average molecular weight from 100 to 5,000.

23. (New) A process according to claim 22, wherein R_{f2} is a perfluoropolyoxyalkylene chain having number average molecular weight from 300 to 2,000.

24. (New) A process according to claim 10, wherein the metal fluorides are alkaline or alkaline-earth metal fluorides.

25. (New) A process according to claim 14, wherein the dipolar aprotic organic compound is tetraglyme or PEO-dimethylethers having number average molecular weight in the range 134 - 2,000.

26. (New) A process according to claim 17, wherein the reaction temperature in the process is from 80 °C to 150 °C.